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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TECH CENTER 1600/2900

JUN 26 2001

RECEIVED

Applicants: M. P. Neeper et al.
Serial No.: 09/642,405 - Case No.: 20413Y
Filed: August 21, 2000
For: SYNTHETIC HUMAN PAPILLOMAVIRUS GENES
Art Unit: 1653
Examiner:

The Assistant Commissioner for Patents
Washington, D.C. 20231

SEQUENCE LISTING

Sir:

REMARKS

Applicants are enclosing a copy of the Sequence Listing in computer readable form.

We the undersigned hereby state that the content of the paper and computer readable copies of the Sequence Listing are the same.

The enclosed diskette contains the Sequence Listing for case number 20413Y.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on the date appearing below.

MERCK & CO., INC.

By Joanne M. Giesser Date June 19, 2001

Respectfully submitted,

By Joanne M. Giesser
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Reg. No. 32,838
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Date: June 19, 2001
Enclosure

09642405-062101



SEQUENCE LISTING

<110> Neeper, Michael P.
McClements, William L.
Jansen, Kathrin U.
Schultz, Loren D.
Chen, Ling
Wang, Xin-Min

<120> SYNTHETIC HUMAN PAPILLOMAVIRUS GENES

<130> 20413Y

<140> 09/642,405

<141> 2000-08-21

<150> PCT/US00/22932

<151> 2000-08-21

<150> 60/210,143

<151> 2000-06-07

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<151> 1999-08-25

<160> 150

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 1518

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 L1

<400> 1

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| gtgggtgagca | ccgacgagta | cgtggcccgc | accaacatct | actaccacgc | cggcaccagc | 120 |
| cgctgtctgg | ccgtgggcca | cccctacttc | cccatacaaga | agcccaacaa | caacaagatc | 180 |
| ctgggtgccc | aggtgagcgg | cctgcagtac | cgctgtgtcc | gcatccacct | gcccgaaccc | 240 |
| aacaagtctg | gcttccccga | cacaagcttc | tacaaccccg | acaccacagc | cctgggtgtg | 300 |
| gcctgcgtgg | gcgtggaggt | gggcccgcgc | cagcccctgg | gcgtggggcat | cagcggccac | 360 |
| cccctgctga | acaagctgga | cgacaccgag | aacgccagcg | cctacgccgc | caacgccggc | 420 |
| gtggacaacc | gcgagtgcac | cagcatggac | tacaagcaga | cccagctgtg | cctgatcggc | 480 |
| tgcaagcctc | ccatcggcga | gcaactgggg | aagggcagcc | cctgcaccaa | cgtggccctg | 540 |
| aacccccggc | actgccctcc | cctggagctg | atcaacaccg | tgatccagga | cggcgacatg | 600 |
| gtggacaccg | gcttcggcgc | catggacttc | accaccctgc | aggccaacaa | gagcgaggtg | 660 |
| cccctggaca | tctgcaccag | catctgcaag | taccccgact | acatcaagat | ggtgagcgag | 720 |
| ccctacggcg | acagcctgtt | cttctacctg | cgccgcgagc | agatgttcgt | gcgccacctg | 780 |
| ttcaaccgcg | ccggcgccgt | gggcgagaac | gtgcccagac | acctgtacat | caagggcagc | 840 |
| ggcagcaccg | ccaacctggc | cagcagcaac | tacttcccca | ctcccagcgg | cagcatggtg | 900 |
| accagcgacg | cccaaattct | caacaagccc | tactggctgc | agcgcgcccc | gggccacaac | 960 |
| aacggcatct | gctggggcaa | ccagctgttc | gtgaccgtgg | tggaaccacc | ccgcagcacc | 1020 |
| aacatgagcc | tgtgcgccgc | catcagcacc | agcgagacca | cctacaagaa | caccaacttc | 1080 |
| aaggagtacc | tgcgccacgg | caggagtagc | gacctgcagt | tcattctcca | gctgtgcaag | 1140 |
| atcacccctga | ccgccgacgt | gatgacctac | atccacagca | tgaacagcac | catcctggag | 1200 |
| gactggaact | tgggcttgca | gccccctccc | ggcggtaccc | tgaggagcac | ctaccgcttc | 1260 |
| gtgaccagcc | aggccatcgc | ctgccagaag | cacacccttc | ccgctcccaa | ggaggatccc | 1320 |
| ctgaagaagt | acaccttctg | ggaggtgaac | ctgaaggaga | agttcagcgc | cgacctggac | 1380 |

| | | | | | | |
|------------|------------|------------|------------|------------|------------|------|
| cagttccccc | tgggcccga | gttcctgctg | caggccggcc | tgaaggccaa | gcccagttc | 1440 |
| accctgggca | agcgcaaggc | cacccccacc | accagcagca | ccagcaccac | cgccaagcgc | 1500 |
| aagaagcgca | agctgtaa | | | | | 1518 |

<210> 2
 <211> 1950
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Mutant, Codon-Optimized HPV16 E1

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| atggccgacc | ccgcccggcac | caacggcgag | gagggcaccg | gctgcaacgg | ctggttctac | 60 |
| gtggaggccg | tgggtggagaa | gaagaccggc | gacgccatca | gcgacgacga | gaacgagAAC | 120 |
| gacagcgaca | ccggcgagga | cctgggtggac | ttcatcgtga | acgacaacga | ctacctgacc | 180 |
| caggccgaga | ccgagaccgc | ccacgccttg | ttcaccgccc | aggaggccaa | gcagcaccgc | 240 |
| gacgcccgtgc | aggtgctgaa | gcgcaagtac | ctggggcagcc | ccctgagcga | catcagcggc | 300 |
| tgcgtcgaca | acaacatcag | ccccgcctg | aaggccatct | gcacgcagaa | gcagagccgc | 360 |
| gcccgaagc | gcccgcctgtt | cgagagcgag | gacagcggct | acggcaacac | cgaggtggag | 420 |
| accagcaga | tgctgcaggt | ggagggccgc | cacgagaccg | agacccctg | cagccagtac | 480 |
| agcggccgga | gcggcgccgc | ctgcagccag | tacagcagcg | gcagcggcgg | cgagggcgtg | 540 |
| agcgagcgcc | acaccatctg | ccagaccctt | ctgaccaaca | tcctgaacgt | gctgaagacc | 600 |
| agcaacgcca | aggccgccat | gctggccaag | ttcaaggagc | tgtacggcgt | gagcttcagc | 660 |
| gagctgggtgc | gcccccttcaa | gagcaacaag | agcacctgct | gcgactgggtg | catcgccgcc | 720 |
| ttcggcctga | ccccagcat | cgccgacagc | atcaagacc | tgctgcagca | gtactgcctg | 780 |
| tacctgcaca | tccagagcct | ggcctgcagc | tggggcatgg | tggtgctgct | gctggtgccg | 840 |
| tacaagtgcg | gcaagaaccg | cgagaccatc | gagaagctgc | tgagcaagct | gctgtgcgtg | 900 |
| agccccatgt | gcatgatgat | cgagcctccc | aagcttcgca | gcaccgccgc | cgccctgtac | 960 |
| tggtacaaga | ccggcatcag | caacatcagc | gaggtgtacg | gcgacacccc | cgagtggatc | 1020 |
| cagcgccaga | ccgtgctgca | gcacagcttc | aacgactgca | ccttcgagct | gagccagatg | 1080 |
| gtgcagtggg | cctacgacaa | cgacatcgtg | gacgacagcg | agatcgccct | caagtacgcc | 1140 |
| cagctggccg | acaccaacag | caacgccagc | gccttcctga | agagcaacag | ccaggccaag | 1200 |
| atcgtgaagg | actgcgccac | catgtgccgc | cactacaagc | gcgccgagaa | gaagcagatg | 1260 |
| agcatgagcc | agtggatcaa | gtaccgctgc | gaccgcgtgg | acgacggcgg | cgaccgcaag | 1320 |
| cagatcgtga | tgttcctgcg | ctaccagggc | gtggaattca | tgagcttcct | gaccgccctg | 1380 |
| aagcgcttcc | tgcagggcat | ccccagaag | aactgcatcc | tgctgtacgg | cgccgccaac | 1440 |
| accgacaaga | gcctgttcgg | catgagcctg | atgaagtcc | tgcagggcag | cgatgatctg | 1500 |
| ttcgtgaaca | gcaagagcca | cttctggctg | cagcccttg | ccgacgccaa | gatcggcag | 1560 |
| ctgggacgac | ccaccgtgcc | ctgctggaac | tacatcgacg | acaacctgcg | caacgccctg | 1620 |
| gacggcaacc | tgggtgagcat | ggacgtgaag | caccgcccc | tgggtgcagct | gaagtgcctt | 1680 |
| cccctgctga | tcaccagcaa | catcaacgcc | ggcaccgaca | gccgctggcc | ctacctgcac | 1740 |
| aaccgcctgg | tgggtgttcac | cttccccaac | gagttccctt | tcgacgagaa | cggtaacccc | 1800 |
| gtgtacgagc | tgaacgacaa | gaactggaag | agcttcttca | gccgcacctg | gagccgcctg | 1860 |
| agcctgcacg | aggacgagga | caaggagaac | gacggcgaca | gcctgcccac | cttcaagtgc | 1920 |
| gtgagcggcc | agaacaccaa | cacctgttaa | | | | 1950 |

<210> 3
 <211> 1098
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Mutant, Codon-Optimized HPV16 E2

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| aacgacagca | ccgacctgcg | cgaccacatc | gactactgga | agcacatgcg | cctggcctgc | 120 |
| gcatctact | acaaggcccg | cgagatgggc | ttcaagcaca | tcaaccacca | ggtgggtgcc | 180 |
| accctggccg | tgagcaagaa | caaggccctg | caggccgccc | agctgcagct | gaccctggag | 240 |
| accatctaca | acagccagta | cagcaacgag | aagtggaccc | tgcaggacgt | gagcctggag | 300 |
| gtgtacctga | ccgccccac | cggctgcatc | aagaagcacg | gctacaccgt | ggaggtgcag | 360 |

| | | | | | | |
|-------------|-------------|-------------|------------|------------|-------------|------|
| ttcgacggcg | acatctgcaa | caccatgcac | tacaccaact | ggacccacat | ctacatctgc | 420 |
| gaggaggcca | gcgtgaccgt | ggtggagggc | caggtggact | actacggcct | gtactacgtg | 480 |
| cacgaggcca | tccgcaccta | cttcgtgcag | ttcaaggacg | acgccgagaa | gtacagcaag | 540 |
| aacaagggtg | gggagggtgca | cgccggcggc | caggtgatcc | tgtgccccac | cagcgtgttc | 600 |
| agcagcaacg | aggtgagcag | ccccgagacc | atccgccagc | acctggccaa | ccacagcgcc | 660 |
| gccaccacaca | ccaaggccgt | ggccctgggc | accgaggaga | cccagaccac | catccagcgc | 720 |
| ccccgcagcg | agcccgacac | cggaaccccc | tgccacacca | ccaagctgct | gcaccgcgac | 780 |
| agcgtggaca | gcgcccccat | cctgaccgcc | ttcaacagca | gccacaaggg | cgcacatcaac | 840 |
| tgcaacagca | acaccacccc | catcgtgcac | ctgaaggggc | acgccaacac | cctgaagtgc | 900 |
| ctgcgctacc | gcttcaagaa | gcactgcaag | ctgtacaccg | ccgtgagcag | cacctggcac | 960 |
| tggaaccggcc | acaacgtgaa | gcacaagagc | gccatcgtga | ccctgacctt | cgacagcgag | 1020 |
| tggcagcgcg | accagttcct | gagccagggtg | aagatcccca | agaccatcac | cgtgagcacc | 1080 |
| ggcttcatga | gcacataa | | | | | 1098 |

<210> 4

<211> 297

<212> DNA

<213> Artificial Sequence

<220>

<223> Mutant, Codon-Optimized HPV16 E7

<400> 4

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| gacctgtacg | gctacggcca | gctgaacgac | agcagcgagg | aggaggacga | gatcgacggc | 120 |
| cccgcgggcc | aggccgagcc | cgaccgcgcc | cactacaaca | tcgtgacctt | ctgctgcaag | 180 |
| tgcgacagca | ccctgcgcct | gtgcgtgcag | agcaccacac | tggacatccg | caccctggag | 240 |
| gacctgtgta | tgggcaccct | gggcatcgtg | tgccccatct | gcagccagaa | gccctaa | 297 |

<210> 5

<211> 297

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV6a E7

<400> 5

| | | | | | | |
|------------|------------|-------------|------------|------------|------------|-----|
| atgcacggcc | gccacgtgac | cctgaaggac | atcgtgctgg | acctgcagcc | tccccacccc | 60 |
| gtgggcctgc | actgctacga | gcagctgggtg | gacagcagcg | aggacgaggt | ggacgaggtg | 120 |
| gacggccagg | acagccagcc | cctgaagcag | cacttccaga | tcgtgacctg | ctgctgcggc | 180 |
| tgcgacagca | acgtgcgcct | ggtgggtgcag | tgcaccgaga | ccgacatccg | cgaggtgcag | 240 |
| cagctcctgc | tgggtaccct | gaacatcgtg | tgccccatct | gcgctcccaa | gacctaa | 297 |

<210> 6

<211> 318

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV18 E7

<400> 6

| | | | | | | |
|------------|-------------|------------|------------|--------------|-------------|-----|
| atgcacggcc | ccaaggccac | cctgcaggac | atcgtgctgc | acctggagcc | ccagaacgag | 60 |
| atccccgtgg | acctgtgtgtg | ccacgagcag | ctgagcgaca | gcgaggagga | gaacgacgag | 120 |
| atcgacggcg | tgaaccacca | gcacctgccc | gctcgcaggg | ccgagcccca | gcgccacacc | 180 |
| atgctgtgca | tgtgctgcaa | gtgcgaggcc | cgcacgcagc | tgggtgggtgga | gagcagcgct | 240 |
| gacgacctgc | gcgccttcca | gcagctgttc | ctgaacaccc | tgagcttcgt | gtgccccctgg | 300 |
| tgcgccagcc | agcagtaa | | | | | 318 |

<210> 7

<211> 1107

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV6a E2

<400> 7

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|-------------|------------|------------|------------|------------|------------|------|
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| gagaacagca | ccgacctgca | caagcacgtg | ctgcactgga | agtgcattgc | ccacgagagc | 120 |
| gtgctgctgt | acaaggccaa | gcagatgggc | ctgagccaca | tcggcatgca | ggtggtgcct | 180 |
| cctctgaagg | tgagcgaggc | caagggccac | aacgccatcg | agatgcagat | gcacctcgag | 240 |
| agcctgctgc | gcaccgagta | cagcatggag | ccctggaccc | tgaggagagc | cagctacgag | 300 |
| atgtggcaga | cccctcccaa | gcgtgcttc | aagaagcgcg | gcaagaccgt | ggaggtgaag | 360 |
| ttcgacggct | gcgccaacaa | caccatggac | tacgtggtgt | ggaccgacgt | gtacgtgcag | 420 |
| gacaacgaca | cctgggtgaa | ggtgcacagc | atggtggacg | ccaagggcat | ctactacacc | 480 |
| tgtggccagt | tcaagaccta | ctacgtgaac | ttcgtgaagg | aggccgagaa | gtacggcagc | 540 |
| accaagcact | gggaggtgtg | ctacggcagc | accgtgatct | gcagccccgc | tagcgtgagc | 600 |
| agcaccaccc | aggaggtgag | catccccgag | agcaccacct | acactcccgc | ccagaccagc | 660 |
| accctggtga | gcagcagcac | caaggaggac | gccgtgcaga | ccccctctcg | caagcgcgcc | 720 |
| cgcggtgctg | agcagagccc | ctgcaacgcc | ctgtgctgtg | cccacatcgg | ccccgtggat | 780 |
| agcggaacc | acaacctgat | caccaacaac | cacgaccagc | accagcgccg | caacaacagc | 840 |
| aacagcagcg | ccactcccat | ctgacgttcc | cagggcgaga | gcaactgcct | gaagtgtctc | 900 |
| cgctaccgcc | tgaacgatcg | ccaccgccac | ctgttcgacc | tgatcagcag | cacctggcac | 960 |
| tgggcccagca | gcaaggctcc | ccacaagcac | gccatcgtga | ccgtgacctc | cgacagcgag | 1020 |
| gagcagcgcc | agcagttcct | ggcagtggtg | aagatccctc | ccaccatcag | ccacaagctg | 1080 |
| ggcttcatga | gcctgcacct | gctgttaa | | | | 1107 |

<210> 8

<211> 1098

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV18 E2

<400> 8

| | | | | | | |
|-------------|------------|-------------|-------------|------------|------------|------|
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| gaccactacg | agaacgacag | caaggacatc | gacagccaga | tccagtactg | gcagctgac | 120 |
| cgctggggaga | acgccatctt | cttcgccgct | cgcgagcagc | ggatccagac | cctgaaccac | 180 |
| caggtgggtgc | ccgectacaa | catcagcaag | agcaaggccc | acaaggccat | cgagctgcag | 240 |
| atggccctgc | agggcctggc | ccagagcgcc | tacaagaccg | aggactggac | cctgcaggac | 300 |
| acctgcgagg | agctgtggaa | caccgagccc | acccactgct | tcaagaaggg | aggccagacc | 360 |
| gtgcaggtgt | acttcgacgg | caacaaggac | aactgcatga | actacgtggc | ctgggacagc | 420 |
| gtgtactaca | tgaccgacgc | cggcacctgg | gacaagaccg | ccacctgcgt | gagccaccgc | 480 |
| ggcctgtact | acgtgaaggc | gggctacaac | acctttctaca | tcgagttcaa | gagcgagtgc | 540 |
| gagaagtacg | gcaacaccgg | cacctgggag | gtgcacttcg | gcaacaacgt | gatcgactgc | 600 |
| aacgacagca | tgtgcagcac | cagcgacgac | accgtgagcg | ccaccagct | ggtgaagcag | 660 |
| ctgcagcaca | ctcccagccc | ctacagcagc | accgtgagcg | tgggcaccgc | caagacctac | 720 |
| ggccagacca | gcgcccggac | tcgcccctggc | cactgcgggc | tggccgagaa | gcagcactgc | 780 |
| gggcccgtga | accctctgct | gggcccggcc | accgccaccg | gcaacaacaa | gcgcccgaag | 840 |
| ctgtgcagcg | gcaacaccac | tcccatcatc | cacctgaagg | gcgaccgcaa | cagcctgaag | 900 |
| tgctgcgggt | accgcctgcg | caagcacagc | gaccactacc | gcgacatcag | cagcacctgg | 960 |
| cactggaccg | gcgcccggaa | cgagaagacc | ggcatcctga | ccgtgacctc | ccacagcgag | 1020 |
| acccagcgca | ccaagttcct | gaacaccgtg | gccatccccg | acagcgtgca | gatcctggtg | 1080 |
| ggctacatga | ccatgtaa | | | | | 1098 |

<210> 9

<211> 129

<212> DNA

<213> Artificial Sequence

<220>

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gtggtgagca ccgacgagta cgtggcccgc accaacatct actaccacgc cggcaccagc      120
cgctgctg                                     129
```

<220>
<223> Codon-Optimized HPV16 L1 fragment

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<400> 10
cgcattccacc tgcctgaccc caacaagttc ggcttccccg acacaagctt ctacaacccc      60
gacacccagc  gcctggtgtg ggcttgctgt ggcttgaggg tgggcccggg ccagcccctg      120
ggcgtgggc                                         129
```

<220>
<223> Codon-Optimized HPV16 L1 fragment

```
<400> 11
gagtgc atca gcatgg gacta caagcag acc cagctgt gcc tgatcgg ctg caagcct ccc 60
atcggcg agc actgggg caa gggcag cccc tgcacca acg tggccgt gaa ccccggc gac 120
tgccct ccc 129
```

<220>
<223> Codon-Optimized HPV16 L1 fragment

```
<400> 12
gccaacaaga gcgagggtgcc cctggacatc tgcaccagca tctgcaagta ccccgactac      60
atcaagatgg tgagcgagcc ctacggcgac agcctgttct tctacctgcg ccgcgagcag      120
atgttcgtgc gc                                     132
```

<220>
<223> Codon-Optimized HPV16 L1 fragment

```
<400> 13
gccagcagca actacttccc cactcccagc ggcagcatgg tgaccagcga cgcccaaata 60
ttcaacaagc cctactggct gcagcgcgcc cagggccaca acaacggcat ctgctggggc 120
aaccagctg                                     129
```

- 5 -

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 L1 fragment

<400> 14

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gagtacctgc gccacggcga ggagtacgac ctgcagttca tcttccagct gtgcaagatc 60
accctgaccg ccgacgtgat gacctacatc cacagcatga acagcaccat cctggaggac 120
tggaacttcg gcctg 135
```

<210> 15

<211> 135

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 L1 fragment

<400> 15

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ttcagcgccg acctggacca gttccccctg ggccgcaagt tctgtgtgca ggccggcctg 120
aaggccaagc ccaag 135
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<210> 16

<211> 135

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 L1 fragment

<400> 16

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gcggctggtg ccggc 135
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<210> 17

<211> 132

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 L1 fragment

<400> 17

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ggcgttctcg gtgtcgccca gcttggttcag cagggggttg ccgctgatgc ccacgccag 120
gggctggccg cg 132
```

<210> 18

<211> 129

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 L1 fragment

<400> 18

```
caggggcacc tcgctcttgt tggcctgcag ggtggtgaag tccatggcgc cgaagccggt 60
gtccaccatg tcgccgtcct ggatcacggt gttgatcagc tccaggggag ggcagtcgcc 120
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<210> 19
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<210> 20
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 <212> DNA
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<220>
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<400> 20
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 cagctgggtg cccacagcaga tgcc 144

<210> 21
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<220>
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<400> 21
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 ccagtctcc ag 132

<210> 22
 <211> 123
 <212> DNA
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<220>
 <223> Codon-Optimized HPV16 L1 fragment

<400> 22
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<210> 23
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<220>
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<400> 23
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<210> 24
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 <212> DNA
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<400> 24
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<210> 25
 <211> 21
 <212> DNA
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<220>
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<400> 25
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<210> 26
 <211> 24
 <212> DNA
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<220>
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<400> 26
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<210> 27
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 <212> DNA
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<220>
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<400> 27
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<210> 28
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 <212> DNA
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<220>
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<400> 28
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<210> 29
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 <212> DNA
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<400> 29
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<210> 30
<211> 24
<212> DNA
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<220>
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<400> 30
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<210> 31
<211> 25
<212> DNA
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<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 31
cactagagat ctgaattctt acagc 25

<210> 32
<211> 38
<212> DNA
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<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 32
catctcagat ctgccaccat gagcctgtgg ctgcccag 38

<210> 33
<211> 129
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 33
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gacagcgac 129

<210> 34
<211> 132
<212> DNA
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<220>
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<400> 34
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ctcgttctcg tc 132

<210> 35
<211> 132
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atctgcatcg ag 132

<210> 36
<211> 131
<212> DNA
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<223> Codon-Optimized HPV16 E1 fragment

<400> 36
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ggccttcagg c 131

<210> 37
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 37
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ggcggctgca gccagtacag cagcggcagc ggcggcgagg gcgtgagcga gcgccacacc 120
atctgccaga cc 132

<210> 38
<211> 135
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 38
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catggcggcc ttggcggttc tgggtcttcag caggttcagg atgttggtca gaggggtctg 120
gcagatggtg tggcg 135

<210> 39
<211> 135
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

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<400> 39
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tacctgcaca tccag 135

<210> 40
<211> 136
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 40
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gcacttgtag cgcaccagca gcagcaccac catgccccag ctgcaggcca ggctctggat 120
gtgcaggtag aggcag 136

<210> 41
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 41
ctgctgtgcg tgagcccat gtgcatgatg atcgagcctc ccaagcttcg cagcaccgcc 60
gccgccctgt actggtacaa gaccggcatc agcaacatca gcgaggtgta cggcgacacc 120
cccagagtga tc 132

<210> 42
<211> 129
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 42
ggcgatctcg ctgtcgtcca cgatgtcggt gtcgtaggcc cactgcacca tctgggtcag 60
ctcgaagggtg cagtcgttga agctgtgctg cagcacggtc tggcgctgga tccactcggg 120
ggtgtcgcc 129

<210> 43
<211> 129
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 43
gtggacgaca gcgagatcgc ctacaagtac gccagctgg ccgacaccaa cagcaacgcc 60
agcgccttcc tgaagagcaa cagccaggcc aagatcgtga aggactgcgc caccatgtgc 120
cgccactac 129

<210> 44
<211> 129
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 44
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gtacttgatc cactgggtca tgctcatctg cttcttctcg gcgcgcttgt agtggcggca      120
catggtggc                                     129

<210> 45
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 45
cagatcgtga tgttcttgcg ctaccagggc gtggaattca tgagcttcct gaccgccctg      60
aagcgcttcc tgcagggcat cccaagaag aactgcatcc tgctgtacgg cgccgccaac      120
accgacaag                                     129

<210> 46
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 46
gccgatcttg gcgtcggcca ggggctgcag ccagaagtgg ctcttgctgt tcacgaagca      60
gatcacgctg ccctgcagga acttcatcag gctcatgccg aacaggctct tgtcgggtgt      120
ggcggcgccg                                     130

<210> 47
<211> 129
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 47
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gacgacaacc tgcgcaacgc cctggacggc aacctggtga gcatggacgt gaagcaccgc      120
cccctggtg                                     129

<210> 48
<211> 132
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 48
gaactcgttg gggaagggtga acaccaccag gcggttgctg aggtagggcc agcggctgtc      60
ggtgccggcg ttgatgttgc tggatgatcag caggggaggg cacttcagct gcaccagggg      120
gcggtgcttc ac                                     126

<210> 49
<211> 126

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<212> DNA
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 aacgacaaga actggaagag cttcttcagc cgcacctgga gccgcctgag cctgcacgag 120
 gacgag 126

 <210> 50
 <211> 105
 <212> DNA
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 <220>
 <223> Codon-Optimized HPV16 E1 fragment

 <400> 50
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 gctgtcgcgc tcgttctcct tgtcctcgtc ctctgtgcagg ctacg 105

 <210> 51
 <211> 23
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 <220>
 <223> Codon-Optimized HPV16 E1 fragment

 <400> 51
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 <210> 52
 <211> 23
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Codon-Optimized HPV16 E1 fragment

 <400> 52
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 <210> 53
 <211> 21
 <212> DNA
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 <220>
 <223> Codon-Optimized HPV16 E1 fragment

 <400> 53
 gagctggtgc gccccttcaa g 21

 <210> 54
 <211> 21
 <212> DNA
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 <220>

<223> Codon-Optimized HPV16 E1 fragment

<400> 54

cttgaagggg cgcaccagct c

21

<210> 55

<211> 21

<212> DNA

<213> Artificial Sequence

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<223> Codon-Optimized HPV16 E1 fragment

<400> 55

ctgctgtgcg tgagcccat g

21

<210> 56

<211> 21

<212> DNA

<213> Artificial Sequence

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<223> Codon-Optimized HPV16 E1 fragment

<400> 56

catggggctc acgcacagca g

21

<210> 57

<211> 21

<212> DNA

<213> Artificial Sequence

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<223> Codon-Optimized HPV16 E1 fragment

<400> 57

gccaccatgt gccgccacta c

21

<210> 58

<211> 21

<212> DNA

<213> Artificial Sequence

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<210> 59

<211> 21

<212> DNA

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<220>

<223> Codon-Optimized HPV16 E1 fragment

<400> 59

ctggccgacg ccaagatcgg c

21

<210> 60

<211> 21

<212> DNA
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 <223> Codon-Optimized HPV16 E1 fragment

<400> 60
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<210> 61
 <211> 24
 <212> DNA
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<220>
 <223> Codon-Optimized HPV16 E1 fragment

<400> 61
 gtgttcacct tccccaacga gttc 24

<210> 62
 <211> 24
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Codon-Optimized HPV16 E1 fragment

<400> 62
 gaactcgttg gggaaggtga acac 24

<210> 63
 <211> 25
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Codon-Optimized HPV16 E1 fragment

<400> 63
 catgagagat ctttacaggg tgttg 25

<210> 64
 <211> 38
 <212> DNA
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<220>
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<400> 64
 catctcagat ctgccaccat ggccgacccc gccggcac 38

<210> 65
 <211> 99
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Codon-Optimized HPV16 E2 fragment

<400> 65

atggagaccc tgtgccagcg cctgaacgtg tgccaggaca agatcctgac ccactacgag 60
aacgacagca ccgacctgcg cgaccacatc gactactgg 99

<210> 66
<211> 104
<212> DNA
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<400> 66
ccaccaggtg gtgcccaccc tggccgtgag caagaacaag gccctgcagg ccgccgagct 60
gcagctgacc ctggagacga tctacaacag ccagtacagc aacg 104

<210> 67
<211> 108
<212> DNA
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<400> 67
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acaccatgca ctacaccaac tggaccacaca ttacatctg tgaggagg 108

<210> 68
<211> 104
<212> DNA
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<400> 68
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caagaacaag gtgtgggagg tgcacgcccg aggccagggtg atcc 104

<210> 69
<211> 110
<212> DNA
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<220>
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<400> 69
ggccaaccac agcgccgcca cccacaccaa ggccgtggcc ctggggcaccg aggagaccga 60
gaccacaatc cagcgccctc gcagcgagcc cgacaccggc aaccctgcc 110

<210> 70
<211> 107
<212> DNA
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<220>
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<400> 70
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acgccaacac cctgaagtgc ctgcggtacc gcttcaagaa gcactgc 107

<210> 71
 <211> 113
 <212> DNA
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<220>
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<400> 71
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 agatggcgca ggccaggcgc atgtgcttcc agtagtcgat gtggtcgcgc agg 113

<210> 72
 <211> 101
 <212> DNA
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<220>
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<400> 72
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<210> 73
 <211> 98
 <212> DNA
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<220>
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<400> 73
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<210> 74
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<220>
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<400> 74
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 tgctgctgaa cacgctggtg gggcacagga tcacctggcc tccggcgtgc 110

<210> 75
 <211> 111
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Codon-Optimized HPV16 E2 fragment

<400> 75
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<210> 76

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<211> 110
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<220>
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tgctgctcac ggcggtgtac agcttgcaat gcttcttgaa gcggtaccgc                  110

<210> 77
<211> 111
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E2 fragment

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tttagatgct catgaagccg gtgctcacgg tgatgggtctt ggggatcttc acctgggtca      60
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<210> 78
<211> 50
<212> DNA
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<220>
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<400> 78
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<210> 79
<211> 45
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 79
ggttgccagat ctagactcga gtttagatgc tcatgaagcc ggtgc                        45

<210> 80
<211> 21
<212> DNA
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<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 80
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<210> 81
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<223> Codon-Optimized HPV16 E2 fragment

<400> 81

ggccaaccac agcgccgcc

19

<210> 82

<211> 21

<212> DNA

<213> Artificial Sequence

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<223> Codon-Optimized HPV16 E2 fragment

<400> 82

gccgtgcttc ttgatgcagc c

21

<210> 83

<211> 17

<212> DNA

<213> Artificial Sequence

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<223> Codon-Optimized HPV16 E2 fragment

<400> 83

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17

<210> 84

<211> 22

<212> DNA

<213> Artificial Sequence

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<223> Codon-Optimized HPV16 E2 fragment

<400> 84

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22

<210> 85

<211> 109

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 E7 fragment

<400> 85

ggccggagat ctgatatcga attcgccacc atgcacggcg acacccccac cctgcacgag

60

tacatgctgg acctgcagcc cgagaccacc gacctgtacg gctacggcc

109

<210> 86

<211> 106

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV16 E7 fragment

<400> 86

gccgagcccg accgcgcca ctacaacatc gtgaccttct gctgcaagtg cgacagcacc

60

ctgcgcctgt gcgtgcagag caccacgtc gacatccgca ccctgg

106

<210> 87
 <211> 96
 <212> DNA
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<220>
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<400> 87
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<210> 88
 <211> 106
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<400> 88
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<210> 89
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<400> 89
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<210> 90
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<400> 90
 ccgcggcaga tctagactcg 20

<210> 91
 <211> 105
 <212> DNA
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<220>
 <223> Codon-Optimized HPV6a E7 fragment

<400> 91
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<210> 92
 <211> 105
 <212> DNA
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<220>
 <223> Codon-Optimized HPV6a E7 fragment

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 <210> 93
 <211> 107
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Codon-Optimized HPV6a E7 fragment

 <400> 93
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 <210> 94
 <211> 102
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Codon-Optimized HPV6a E7 fragment

 <400> 94
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 <212> DNA
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 <220>
 <223> PCR Primer

 <400> 95
 gtcacagatc tgatatcgaa ttcc 24

 <210> 96
 <211> 26
 <212> DNA
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 <220>
 <223> PCR Primer

 <400> 96
 cagtcagatc tagagatatc tttagg 26

 <210> 97
 <211> 109
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Codon-Optimized HPV18 E7 fragment

<400> 97
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<210> 98
 <211> 111
 <212> DNA
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<220>
 <223> Codon-Optimized HPV18 E7 fragment

<400> 98
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 ctcctcgctg tcgctcagct gctcgtggca cagcaggctc acgggggatct c 111

<210> 99
 <211> 108
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Codon-Optimized HPV18 E7 fragment

<400> 99
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<210> 100
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 <212> DNA
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<220>
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<210> 101
 <211> 26
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> PCR Fragment

<400> 101
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<210> 102
 <211> 27
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> PCR Fragment

<400> 102
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<210> 103
 <211> 90
 <212> DNA
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 <220>
 <223> Codon-Optimized HPV6 E2 fragment

 <400> 103
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 cagctgctgg agctgtacga ggagaacagc 90

 <210> 104
 <211> 92
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Codon-Optimized HPV6 E2 fragment

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 ggtcgggtgct gttctcctcg tacagctcca gc 92

 <210> 105
 <211> 96
 <212> DNA
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 <220>
 <223> Codon-Optimized HPV6 E2 fragment

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 <210> 106
 <211> 103
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 <210> 107
 <211> 98
 <212> DNA
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 <220>
 <223> Codon-Optimized HPV6 E2 fragment

 <400> 107
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 <210> 108
 <211> 102


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<212> DNA
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<220>
<223> Codon-Optimized HPV6 E2 fragment

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<210> 109
<211> 102
<212> DNA
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<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 109
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<210> 110
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<400> 110
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<210> 111
<211> 94
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<223> Codon-Optimized HPV6 E2 fragment

<400> 111
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<210> 112
<211> 97
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<210> 113
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<210> 114

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<400> 114

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<210> 115

<211> 95

<212> DNA

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<210> 116

<211> 96

<212> DNA

<213> Artificial Sequence

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<400> 116

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<210> 117

<211> 95

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon-Optimized HPV6 E2 fragment

<400> 117

gcagcaaggc tccccacaag cagccatcg tgaccgtgac ctacgacagc gaggagcagc 60
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<210> 118

<211> 96

<212> DNA

<213> Artificial Sequence

<220>

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<223> Codon-Optimized HPV6 E2 fragment

<400> 118
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tggctgatgg tgggagggat cttcaccacg tccagg                                   96

<210> 119
<211> 25
<212> DNA
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<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 119
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<210> 120
<211> 21
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<400> 120
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<210> 121
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<400> 121
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<210> 122
<211> 25
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<400> 122
gctgccgtag cacacctccc agtgc                                           25

<210> 123
<211> 21
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<400> 123
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<210> 124

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<211> 23
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 <400> 124
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 <210> 125
 <211> 22
 <212> DNA
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 <400> 125
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 <210> 126
 <211> 26
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 <400> 126
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 <210> 127
 <211> 97
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 <210> 128
 <211> 98
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 <400> 128
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 <210> 129
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<400> 129
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<210> 131
<211> 91
<212> DNA
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<210> 132
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<210> 133
<211> 90
<212> DNA
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<400> 133
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<210> 134
<211> 92
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<400> 134
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<210> 135
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<210> 136
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 <212> DNA
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<210> 138
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<210> 139
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<210> 141
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<210> 142
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<210> 143
 <211> 25
 <212> DNA
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<220>
 <223> Codon-Optimized HPV18 E2 fragment

<400> 143
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<210> 144
 <211> 23
 <212> DNA
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<400> 144
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<210> 145
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<212> DNA
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 <210> 147
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 <210> 148
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 <210> 150
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